

HIV prevalence and trends from data in Zimbabwe, 1997–2004

A Mahomva, S Greby, S Dube, O Mugurungi, J Hargrove, D Rosen, K-L Dehne, S Gregson, M St Louis, S Hader

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See end of article for authors' affiliations

Correspondence to: S Greby, CDC Zimbabwe, 2180 Harare Place, Washington DC 20521-2180, USA; grebys@zimcdc.co.zw

Background: This paper brings together data from a variety of reports to provide a basis for assessing future steps for responding to and monitoring the HIV epidemic in Zimbabwe.

Method: Data reported from four antenatal clinic (ANC) surveys conducted between 2000 and 2004, two small local studies in Zimbabwe conducted from 1997 through 2003, four general population surveys from 1999 through 2003, and service statistics covering 1990 through 2004 were used to describe recent trends in HIV prevalence and incidence, behaviour change, and programme provision.

Results: HIV prevalence among pregnant women attending ANCs declined substantially from 32.1% in 2000 to 23.9% in 2004. The local studies confirmed the decline in prevalence. However, prevalence continued to be high. Sexual behaviour data from surveys suggests a reduction in sexual experience before age 15 years among both males and females age 15–19 years, and in the proportions of males and females aged 15–29 years reporting non-regular sexual partners in the past 12 months. Reported condom use with non-regular partners has been high since 1999. Condom distribution and HIV counseling and testing increased from 2000 to 2004.

Discussion: On the basis of examination of data from a variety of sources, the recent decrease in HIV prevalence may be related to recent reductions in early-age sexual activity and non-regular sexual partnerships and increases in condom use. Comparison of data from sentinel surveillance systems, population based serosurveys, local studies, and service statistics provide increased confidence that a decline in HIV prevalence in Zimbabwe is actually happening in the population.

Zimbabwe is experiencing one of the world's most severe HIV and AIDS crises.¹ The HIV epidemic in Zimbabwe took hold in the mid-1980s.¹ Early HIV screening by the national Blood Transfusion Services (BTS) indicated that HIV prevalence was 2–3% among blood donors in the mid-1980s. The Joint United Nations Programme on AIDS (UNAIDS) in its *Report on the Global HIV/AIDS Epidemic* in 2002 stated that the estimated adult HIV/AIDS prevalence in Zimbabwe was 33.7% in 2001.² Using the Epidemic Projection Package (EPP), and based on surveillance data of improved quality and representativeness, Zimbabwe produced national estimates of HIV/AIDS prevalence among adults aged 15–49 years in Zimbabwe as 24.6% in 2003 (range from 20% to 28%).³ There were an estimated 1 820 000 Zimbabweans living with HIV/AIDS during 2003, over half of whom were women.³

Zimbabwe is a land-locked country of some 11.6 million people in southern Africa. The country is divided into 10 administrative provinces and two major cities. Of the total population, 58% resides in the rural areas, 32% in urban areas, and the remaining 10% in "other" transitional areas that are not classified as strictly urban or rural.³ These areas include mines, commercial farms, or growth points, defined as growing economic communities in predominately rural areas. Despite recent economic difficulties, Zimbabwe remains one of the more developed countries in sub-Saharan Africa with a gross national income (GNI) of US\$2120, an educated population, and a well developed transport and communications infrastructure.⁴ The GNI comprises the total value of goods and services produced within a country together with income received from other countries.⁴ Mortality rates were among the lowest in the region prior to HIV/AIDS and fertility rates were already in decline in the 1980s.⁵

Zimbabwe has a wealth of published and unpublished reports from a variety of data sources that may be used for local and national HIV/AIDS advocacy and planning. HIV antenatal clinic (ANC) surveys have been in place since 1990. These include the ANC surveys conducted in 2000,⁶ 2001,⁷ 2002,⁸ and 2004.⁹ Behavioural data are available from reports of the 2001/2002 Young Adult Survey (YAS),¹⁰ the 1999 Zimbabwe Demographic and Health Surveys (ZDHS),¹¹ and the 2001 and 2003 Population Services International (PSI) youth surveys.^{12–13} Service providers such as the Ministry of Health and Child Welfare (MOHCW) and PSI, and technical agencies such as the US Centers for Disease Control and Prevention (CDC) track the use of services, including condom distribution and voluntary counseling and testing (CT and VCT) services, which are essential for monitoring effective HIV prevention campaigns (MOHCW, unpublished data; PSI, unpublished data; CDC, unpublished data).

Use of data from routine sentinel surveillance systems, population based surveys, and local studies result in a stronger epidemiological profile than using any one surveillance approach alone. In this paper, we bring together data from these various reports to describe recent trends in HIV prevalence and incidence, behaviour change, and programme provision in Zimbabwe. It is hoped that this synthesis will provide a basis for assessing future steps for responding to and monitoring the national HIV epidemic.

Abbreviations: AIDS, acquired immune deficiency syndrome; ANC, antenatal clinic; CDC, Centers for Disease Control and Prevention; GNI, gross national income; HIV, human immunodeficiency virus; MOHCW, Ministry of Health and Child Welfare; PMTCT, prevention of mother-to-child transmission; PSI, Population Services International; (V)CT, (voluntary) counseling and testing; YAS, Young Adult Survey; ZDHS, Zimbabwe Demographic and Health Surveys

DATA SOURCES

National HIV antenatal care surveillance

ANC sentinel surveillance for monitoring HIV prevalence in generalised HIV epidemics was first recommended by the World Health Organization in 1989.¹⁴ Zimbabwe's national ANC surveillance system was established in 1990, and ANC services have been a routinely used source of health care in Zimbabwe. According to the last available population based behavioural and health services survey, the 1999 ZDHS, 93% of pregnant women received antenatal care from a trained health professional.¹¹ Prior to 2000, the ANC survey methods were not documented, participating clinics varied each survey year, and laboratory quality assurance was not defined. In 2000, the ANC survey methods were strengthened and standardised.^{6–9} The 2000 and 2004 surveys used the same clinics and procedures to provide consistent and comparable data across time and region. All participating laboratories used standardised laboratory procedures, including training and quality assurance practices.

Each survey was a non-probability, cross-sectional, anonymous, and unlinked HIV serosurvey of pregnant women accessing ANC services at public health clinics across the country. A total of 19 clinics contributed to the survey in 2002 and 2004, 18 of which also participated in the 2000 and 2001 surveys. In each province, two clinics were selected from a rural, farming, mining, growth point, or town setting. In each major city one clinic was selected. Clinics were categorised by location into urban (cities and large towns), rural (communal and resettlement subsistence farming areas and small-scale commercial farms), and "other" (mines, large scale commercial farms, or growth points). Blood specimens routinely collected from ANC clients for syphilis screening were used for unlinked, anonymous HIV testing. All pregnant women presenting for antenatal care services at one of the sentinel clinic sites during the survey period were eligible for inclusion in the serosurvey.^{6–9} Only laboratories with evidence of participation and satisfactory performance in the Zimbabwe National Quality Assurance Program (ZINQAP) were allowed to test specimens for the ANC survey.

For this comprehensive surveillance assessment, we reviewed national HIV prevalence data reported from four ANC surveys completed by the Zimbabwe MOHCW between 2000 and 2004. The trends in HIV prevalence from 2000 to 2004 were assessed using the HIV results determined with a single test, the Biorad Genscreen ELISA test kit (Bio-Rad Laboratories, Hercules, California).⁹ This test was used over all the survey years with the exception of HIV results from Binga and Sadza in 2002. The quality of the samples from these two clinics was compromised, probably during transportation, and the more epidemiologically plausible test results from a parallel testing algorithm using two different ELISA test kits with a third kit as a tie breaker were used in place of the Genscreen test kit results. In the 2004 ANC, overall HIV prevalence was calculated using three HIV tests in a parallel testing algorithm. Results from the western blot test were used if the Genscreen and Thermo LabSystems (Thermo Electron Corp., Waltham, Massachusetts) ELISA results were discordant.⁹

Local HIV surveillance

We obtained local HIV prevalence data from reports of a cohort study conducted in Manicaland province in eastern Zimbabwe and a clinical trial in the north central cities of Harare and Chitungwiza. In the former, a cohort of 10 000 adults was followed in two rounds, the first in 1998–2000 and the second in 2001–03. HIV prevalence and behavioural data were collected in each round.¹⁵ In the latter, 14 110 women were followed from 14 maternity clinics in the closely connected cities of Harare and Chitungwiza from November

1997 to January 2000 and tested for HIV within 96 hours of giving birth.¹⁶

HIV incidence

We were not able to obtain a direct measure of HIV incidence from published or unpublished national reports. Instead, prevalence trends among ANC and YAS participants in the 15–24 year old age group were used as a proxy to reflect underlying trends in incidence since these individuals are likely to be more recently exposed and infected with HIV than older age groups.¹⁷

Sexual behaviour

We reviewed data on sexual behaviour from four national population based surveys spanning the period from 1999 to 2003. Where possible, original data were accessed and reanalysed to create comparable samples across all surveys by age, sex, and behaviour. The 2001/2002 YAS was a cross-sectional behavioural survey with an anonymous and unlinked HIV biomarker, targeting males and females aged 15–29 years residing in Zimbabwe in 2001. The sample design used a multistage area-stratified household probability sample.¹⁰ The rural classification in the YAS included the areas classified in the ANC surveys as "other" areas. HIV prevalence data were also available from the YAS. The 1999 ZDHS survey was based on nationally representative samples of men aged 15–54 and women aged 15–49 years old.^{11 18} In the 2001 and 2003 PSI youth surveys young adults aged 15–34 years were interviewed and the surveys were based on a multistage cluster sampling procedure—randomly sampling districts, sampling enumeration areas proportionately to size, and finally randomly selecting individuals from systematically randomly selected households.^{12 13}

Sexual behaviour measures were not consistent over time. The percentage of people reporting condom use was available from all surveys over all years, but the PSI youth surveys specified condom use at last risky sex act and not last sex act with a non-regular partner, which was used in the DHS and YAS.

Service statistics

We also considered programme data from services or supplies routinely monitored by the MOHCW, PSI, and CDC Zimbabwe from 1990 to 2004. PSI tracks distribution of condoms and utilisation of VCT services, which are provided in new start centres. The MOHCW and CDC track the number of HIV rapid test kits distributed to prevention of mother-to-child transmission (PMTCT) sites and clinical sites providing CT services. Two rapid HIV test kits are used for the initial screening. A tie breaker is required in approximately 10% of cases where the results are discordant (PSI, unpublished data). Therefore, individuals tested are estimated by $N/2.1$ where N is the number of test kits provided and 2.1 is the number of test kits required for each screening event (CDC, unpublished data).

DATA

Trends in HIV prevalence in antenatal and postnatal clinic attendees

Overall HIV prevalence among women aged 15–49 years in the 2004 ANC survey, measured using the parallel test algorithm, was 21.3%.⁹ Based on the Genscreen test, HIV prevalence in 2004 was 23.9%, having fallen slightly from 2000 to 2001, levelled-off between 2001 and 2002, and declined substantially between 2002 and 2004 (fig 1 and table 1). Although the overall decline between 2000 and 2004 was statistically significant (Cochran-Armitage Trend Test, $Z = 10.6599$, $p < 0.0001$ (1-sided)), the prevalence continued to be high—above 20%.⁹ Trends in HIV prevalence by

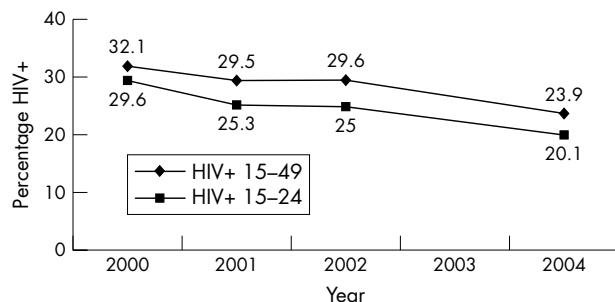


Figure 1 HIV prevalence among ANC attendees by age, Zimbabwe 2000–2004.

province are also shown in table 1. Declines in prevalence appear to have occurred across all provinces and types of residential area (table 1).

Data from the ZVITAMBO (Zimbabwe vitamin A for mothers and babies) trial also provide strong evidence for a significant, sustained decline in baseline HIV prevalence among pregnant women in urban areas of Harare and Chitungwiza during the 27-month enrolment period and subsequent ANC surveys. In these areas, HIV prevalence peaked towards the end of 1998 at 35% and decreased to 25% in 2002.¹⁶

Trends in HIV prevalence in general population samples

HIV prevalence in 15–29 year olds in the population based YAS¹⁰ conducted in 2001–2002 was 21.8% and 10.3% among women and men, respectively (table 1). In the general population cohort in rural areas of Manicaland province, a

significant decline (logistic regression controlling for age, sex, and location; $p < 0.01$) in HIV prevalence from 23.0% to 20.5% was recorded between the first (1998–2000) and second rounds (2001–2003) of the study.¹⁰ Declines were recorded in small towns, large scale commercial farms, roadside business centres, and subsistence farming areas.⁵

In the nationally representative YAS and the localised Manicaland study, HIV prevalence increased with higher number of reported lifetime sexual partners in both sexes.^{10 19}

Trends in HIV incidence in ANC attendees and the general population

Data from the 2000 through 2004 ANC surveys show that statistically significant reductions in HIV prevalence in the 15–19 year (Cochran-Armitage Trend Test, $Z = 7.4063$, $p < 0.0001$ (1-sided)) and 20–24 year (Cochran-Armitage Trend Test, $Z = 5.7964$, $p < 0.0001$ (1-sided)) age groups are consistent with declines in the rate of new infections. Furthermore, HIV prevalence fell for most single years of age (data not shown) between 2000 and 2004 consistent with declines in the rate of new infections at each year of age.⁹

HIV prevalence measures for young women aged 15–19 years and 20–24 years from the 2001/2002 YAS were lower than the measures from the corresponding survey year for the ANC survey of 2001 (table 1). However, HIV prevalence among women in the YAS who had ever been pregnant and among women aged 15–29 years in the 2001 ANC survey was similar for women aged 15–19 years in the YAS and ANC (19.4% and 19.5%, respectively) and aged 25–29 years (34.7% and 36.6%).²⁰

Sexual behaviour change

Data on consistent measures of sexual behaviour were available for a limited number of indicators: age at first

Table 1 HIV prevalence 2000–2004 ANC and 2001/2002 YAS for all age groups, and for age group 15–24 years by province and residence

	ANC survey year*		2002 n=6942	2004 n=7123	YAS 2001/2002†	
	2000 n=6121	2001 n=6790			Females n=6671	Males n=7662
All age groups (years)						
15–19	24.9	19.5	19.1	13.7	10.6	2.1
20–24	31.8	28.9	29.0	24.0	26.1	9.2
25–29	36.9	36.6	38.5	30.8	34.7	24.4
30–34	41.7	40.1	37.5	30.4	–	–
35–39	29.5	31.0	36.4	28.2	–	–
40–44	14.6	22.2	24.1	17.7	–	–
Overall	32.1	29.5	29.6	23.9	21.8	10.3
Age group 15–24 years						
By province‡						
Manicaland	24.4	16.9	16.8	15.1	15.5	5.5
Mashonaland East	35.9	28.1	27.9	19.8	11.4	2.4
Mashonaland Central	26.0	20.0	24.2	14.9	19.5	4.9
Mashonaland West	32.1	30.8	22.4	23.4	17.9	4.7
Matabeleland North	33.5	27.9	25.8	20.6	15.8	8.8
Matabeleland South	32.2	32.5	33.7	23.0	33.6	7.0
Masvingo	27.2	20.8	28.4	24.6	13.6	2.0
Midlands	46.0	20.4	21.0	22.4	14.0	3.6
Harare	21.2	29.8	22.6	18.6	19.0	5.6
Chitungwiza	24.3	26.8	27.8	21.3	–	–
Bulawayo	28.2	23.3	23.9	16.5	16.7	4.5
Overall	29.1	25.2	25.0	20.1	17.4	5.0
By residence§						
Urban	30.2	25.3	24.5	20.1	18.3	5.1
Rural	28.1	20.9	22.8	18.8	16.8	4.9
Other	32.2	30.6	28.9	21.6	–	–

*HIV prevalence determined using the Genscreen HIV test.

†HIV prevalence determined using a parallel HIV testing algorithm.

‡The ANC Survey HIV prevalence was based a limited number of data from each province and are not necessarily representative of HIV prevalence in the province population.

§The definition of residence was different in the ANC and the YAS.

ANC, antenatal clinic; YAS, Young Adult Survey.

Table 2 Abstinence, be faithful, and condom use trends from the 1999 ZDHS, 2001/2002 YAS, and 2001 and 2003 PSI youth survey

	Age group (years)		Females (%)				Males (%)			
			ZDHS 1999	YAS 2001/2002	PSI 2001	PSI 2003	ZDHS 1999	YAS 2001/2002	PSI 2001	PSI 2003
Age at first sex										
Had sex before age 15 years	15–19	–		5.5 4.5 to 6.5* 2072†	5.2 3.6 to 6.9 707	4.5 2.8 to 6.2 558	–	8.8 7.5 to 10.0 2054	6.6 4.7 to 8.5 656	4.6 2.5 to 6.8 366
Had sex before age 20 years	20–24	–		6.2 5.9 to 6.4 1548	5.9 5.5 to 6.4 474	5.7 5.2 to 6.1 532	–	5.6 5.3 to 5.9 1311	6.3 5.9 to 6.7 598	5.8 5.4 to 6.2 639
Non-regular sexual partners										
More than one non-regular partner in past 12 months	15–29	–	–	–	17.2 14.6 to 19.8 137	8.2 7.1 to 9.3 75	–	–	32.2 29.5 to 36.0 358	21.3 19.1 to 23.5 200
Condom use with non-regular partners										
Condom use at last sex with a non-regular partner	15–29		62.4 52.5 to 72.3 92	45.1 41.7 to 48.6 802	79.2 72.4 to 86.0 137	83.3 74.5 to 92.1 75	73.6 66.9 to 80.3 168	63.4 61.2 to 65.7 1776	81.5 77.5 to 85.5 358	85.9 81.0 to 90.8 200

*95% CI.

†Sample size.

PSI, Population Services International; YAS, Young Adult Survey; ZDHS, Zimbabwe Demographic and Health Surveys.

sex, more than one non-regular sexual partner in the past year, and condom use at last sex with a non-regular partner (table 2).

Comparison of the YAS and PSI survey estimates suggests a non-statistically significant reduction in sexual experience before age 15 years among those aged 15–19 years for both males and females between 2001 and 2003 but little change in sexual experience before age 20 years among those aged 20–24 years. However, the PSI data indicate statistically significant reductions in the proportions of males and females reporting non-regular sexual partners in the past 12 months. Reported condom use with non-regular partners varies between surveys possibly due to differences in measurement bias but appears to have been quite high as early as 1999.

Service indicators

Condoms

Condom distribution rose steadily in the mid-late 1990s, reached a peak in 1999 and declined from 1999 to 2000, and increased from 2000 to 2004 (table 3). From 1997 onwards, emphasis shifted from public sector to social marketing distribution with more than half of the total number of condoms distributed in 2003 and 2004 being through social marketing outlets.

In the YAS, most sexually experienced young men (95%) and women (69%) reported knowing where to get male condoms. Knowledge of a source of condoms was associated

with increasing age, education, socioeconomic status, and urban residence.¹⁰

HIV CT services

HIV CT services increased each year in Zimbabwe from 1999 onwards (table 3). CT services started in new start centres, the majority not associated with existing clinics in healthcare settings. In late 2002, the MOHCW started providing services in existing clinics first through the PMTCT programme and then expanding to other clinical settings. The testing in clinical settings uses HIV rapid tests, allowing return of HIV test results the same day of services.

The PSI youth surveys found a general increase in knowledge about and demand for VCT services.^{12–13} The 2001/2002 YAS found that only 10% of females and 5% of males aged 15–29 years reported having ever been tested for HIV. However, over 80% of young women and men who had not had a test indicated that they would like to be tested. The perception of not being at risk for infection was the commonest reason given by women and men for not being tested. Perception of not being at risk was higher in urban areas (40%) than in rural areas (27%). Among the YAS population, 18% of women and 9% of men who did not perceive themselves to be at risk had HIV infection. Difficulty affording or accessing testing was mentioned as the second commonest reason for not having an HIV test, particularly for those residing in rural areas.¹⁰

Table 3 Condom distribution and voluntary counseling and testing (CT or VCT) services, unpublished programme data from MOHCW, PSI, and CDC

	Service year														
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Condoms distributed (millions)															
Public	20.9	24.3	35	21.3	25.6	42.1	48.5	42.2	50.8	50.9	39.9	39.9	44.5	29.8	37.3
Commercial											0.5	0.2			
Social market	0.6	1.2	1.3	0.1	0.9	0.6	0.8	1.9	4.8	8.9	9.1	15.5	24.6	38.3	43.8
VCT clients															
New start centres	–	–	–	–	–	–	–	–	–	2217	11 441	43 780	60 686	109 179	135 858
PMTCT and MOHCW														194 589	312 740

CDC, Centers for Disease Control and Prevention; MOHCW, Ministry of Health and Child Welfare; PMTCT, prevention of mother-to-child transmission; PSI, Population Services International.

Key messages

- HIV prevalence in Zimbabwe declined from 2000 to 2004.
- The decline in HIV prevalence may be related to reductions in early age sexual activity and non-regular sexual partnerships, and increases in condom use.
- Comparison of data from sentinel surveillance systems, population based serosurveys, local studies, and service statistics provide confidence that the decline in HIV prevalence in Zimbabwe reflects a true decline over this period.

DISCUSSION

The overall prevalence of HIV infection among women participating in ANC surveys decreased between 2000 and 2004. This decline was seen in most age groups and in all provinces and locations. Local studies in Manicaland province and in the urban areas of Harare and Chitungwiza also found declines in HIV prevalence during the same time period, starting in the late 1990s. General population and service data suggest recent reductions in early age sexual activity and non-regular sexual partnerships and increases in condom use during the 1990s, which may have contributed to the decline in HIV prevalence.

Comparison of data from sentinel surveillance systems, such as the ANC surveys, with data from population based serosurveys, such as the YAS, and data from local studies, such as the one in Manicaland province, provided validation for the methods and findings from the sentinel surveillance systems. The comparison of these data also increased the confidence in the prevalence and incidence estimates generated by both surveys. Adjusting for "ever pregnant" among young women in the YAS showed similar HIV prevalence results in the population based YAS and clinic based ANC samples. The population based and local data supported including the residential category "other" areas in ANC surveys. The "other" areas are discrete, small, mobile settings, which typically have a higher HIV prevalence than urban areas, comprise only a small percentage of the total population. However, these were previously classified as rural, the majority of the population in Zimbabwe. The separate "other" category resulted in a more accurate picture of the focal points of the HIV epidemic in Zimbabwe and more accurate national estimates of HIV/AIDS prevalence.

The sexual behaviour data should be interpreted with caution because these data were subject to various biases. Sexual activity may be underreported. This can be seen from the HIV prevalence of 8.3% and 2.5% among 15–24 year old females and males, respectively, who reported in the YAS that they had never had sex. Despite examining data from a total of four population based behaviour surveys spanning several years in Zimbabwe, we were only able to report three behaviour indicators because of the lack of consistent measurement over time. Even for these three indicators, there were inconsistencies in measurement. To improve monitoring and evaluation of the effects of HIV prevention interventions at country level, standard behaviour indicators must be adopted and applied in Zimbabwe and internationally.

Sentinel surveillance of pregnant women attending ANC remains the most consistently available and comparable way of monitoring the level and trends of HIV prevalence both within Zimbabwe and between countries. Additional rounds of ANC and population based serosurveys, such as the 2005 ZDHS+, a traditional DHS with collection of biomarkers to

measure anaemia and HIV serostatus, will be essential to the improvement of HIV surveillance systems. A national monitoring and evaluation system is being developed by the Zimbabwe National AIDS Council and partners. In particular, it is hoped that this will provide the means to link prevention interventions with changes in HIV prevalence.

Despite the decline in HIV prevalence, Zimbabwe continues to have one of the highest HIV prevalences in the world. Continual investment of technical and financial resources to maintain and build the public health infrastructure in Zimbabwe will help build our existing data sources, improve our ability to monitor trends in the HIV epidemic, and provide insights into how to strengthen and target the next generation of interventions. The evolving understanding of the epidemic and continual improvement of HIV prevalence measures and behavioural indicators pose important opportunities for communication and advocacy to effectively respond to the HIV and AIDS epidemic in Zimbabwe.

AUTHORS' CONTRIBUTIONS

A Mahomva: conception and drafting the paper, data contributions for ANC, YAS, and PMTCT; S Greby: conception and drafting the paper, analysis and interpretation of data; S Dube: conception and drafting the paper, analysis and interpretation of data; O Mugurungi: critical review of the paper; J Hargrove: data contributions for ZVITAMBO, critical review of the paper; D Rosen: analysis and interpretation of data, critical review of the paper; K-L Dehne: critical review of the paper; S Gregson: conception and drafting the paper, data contributions for PSI, analysis and interpretation of data; M St Louis: critical review of the paper; S Hader: critical review of the paper.

Authors' affiliations

A Mahomva, O Mugurungi, Ministry of Health and Child Welfare, Harare, Zimbabwe
S Greby, D Rosen, S Hader, Centers for Disease Control and Prevention, Harare, Zimbabwe
S Dube, Imperial College, London, UK
J Hargrove, ZVITAMBO, Harare, Zimbabwe
K-L Dehne, Joint United Nations Programme on AIDS, Zimbabwe
S Gregson, Imperial College, London and Biomedical Research and Training Institute, Harare, Zimbabwe
M St Louis, Centers for Disease Control and Prevention, Atlanta, GA, USA

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